

CLAIMS:

1. A sensor, comprising:
a sensing element comprising
a first electrode and a second electrode in mutual ionic communication with an electrolyte;
a first socket defining a first chamber configured to receive a first terminal element;
a first lead disposed in electrical communication with the first electrode and in physical contact with the first socket and configured for electrical communication with the first terminal element;
a second socket defining a second chamber configured to receive a second terminal element; and
a second lead disposed in electrical communication with the second electrode and in physical contact with the second socket and configured for electrical communication with the second terminal element.
2. The sensor of Claim 1, further comprising the first terminal element disposed in the first socket and in electrical communication with the first lead.
3. The sensor of Claim 1, further comprising
a first heater socket defining a first heater chamber configured to receive a first heater terminal element; and
a first heater lead disposed in electrical communication with a heater element and in physical contact with the first heater socket and configured for electrical communication with the first heater terminal element.
4. The sensor of Claim 1, further comprising a plug comprising the first terminal element and the second terminal element, wherein the first terminal element is disposed in the first socket in physical contact and electrical communication with the first lead, and the second terminal element is disposed in the second socket in physical contact and electrical communication with the second lead.
5. The sensor of Claim 4, further comprising a first braze disposed between the first terminal element and at least one of the first socket and the first lead.

6. The sensor of Claim 1, wherein the sensor is selected from the group consisting of planar gas sensor, field effect transistor, semiconductor, and resistance temperature detector.

7. The sensor of Claim 1, further comprising a wiring harness is physically connected to the sensor element and is configured for electrical communication with a control module, wherein the wiring comprises
the first terminal element disposed in the first socket and in physical contact and electrical communication with the first lead and with a first wire; and
the second terminal element disposed in the second socket and in physical contact and electrical communication with the second lead and with a second wire.

8. The sensor of Claim 7, wherein the wiring harness is removably connected to the sensor element.

9. The sensor of Claim 1, wherein the first socket is disposed through at least one of an edge and an end of the sensor element, and wherein the second socket is disposed through at least one of the edge and the end of the sensor element.

10. The sensor of Claim 1, wherein the first socket is disposed parallel to a first plane comprising the first lead, and the second socket is disposed parallel to a second plane comprising the second lead.

11. A sensor, comprising:

a wiring harness configured for electrical communication with a control module and comprising a first terminal element in electrical communication with a first wire, a second terminal element in electrical communication with a second wire, first heater terminal element in electrical communication with a first heater wire, and second heater terminal element in electrical communication with a second heater wire;

a sensor element comprising

a first electrode and a second electrode in mutual ionic communication with an electrolyte, and a rear portion disposed at an end of the sensor element opposite the first electrode;

a heater element in thermal communication with the first electrode and the second electrode;

a first socket defining a first chamber configured to receive the first terminal element;

a first lead disposed in electrical communication with the first electrode and in physical contact with the first socket;

a second socket defining a second chamber configured to receive the second terminal element;

a second lead disposed in electrical communication with the second electrode and in physical contact with the second socket;

a first heater socket defining a first heater chamber configured to receive the first heater terminal element;

a first heater lead disposed in electrical communication with the heater element in physical contact with the first heater socket;

a second heater socket defining a second chamber configured to receive the second heater terminal element; and

a second heater lead disposed in electrical communication with the heater element in physical contact with the second heater socket;

wherein the first terminal element is in electrical communication with the first lead, the second terminal element is in electrical communication with the second lead, the first heater terminal element is in electrical communication with the first heater lead, and the second heater terminal element is in electrical communication with the second heater lead.

12. A sensor, comprising:

a wiring harness configured for electrical communication with a control module and comprising a first terminal element in physical contact and electrical communication with a first wire, and a second terminal element in physical contact and electrical communication with a second wire;

a sensor element comprising

a first electrode and a second electrode in mutual ionic communication with an electrolyte, wherein the sensor element has a rear portion disposed at an end opposite the first electrode;

a first socket disposed near the rear portion of the sensor element;

a first lead disposed in electrical communication with the first electrode and in physical contact with the first socket;

a second socket disposed near the rear portion of the sensor element;

a second lead disposed in electrical communication with the second electrode and in physical contact with the second socket;

wherein the first terminal element is in physical contact with the first lead, and the second terminal element is in physical contact with the second lead.

13. The sensor of Claim 12, further comprising

a heater element disposed in thermal communication with the first electrode and the second electrode;

a first heater socket disposed near the rear portion of the sensor element;

a first heater lead disposed in electrical communication with the heater element in physical contact with the first heater socket;

a second heater socket disposed near the rear portion of the sensor element; and

a second heater lead disposed in electrical communication with the heater element in physical contact with the second heater socket;

wherein the first heater terminal element is in physical contact and electrical communication with the first heater lead, and the second heater terminal element is in physical contact and in electrical communication with the second heater lead.

14. The sensor of Claim 12, wherein the first terminal element is removably disposed in the first socket and the second terminal element is removably disposed in the second socket.

15. A method for making a sensor, comprising:
forming a sensing element comprising a first electrode and a second electrode on an electrolyte layer, with a first lead disposed from the first electrode to a rear portion of the sensing element and a second lead from the second electrode to the rear portion;

forming a first socket defining a first chamber configured to receive a first terminal element, wherein the first lead extends into the first socket;

forming a second socket defining a second chamber configured to receive a second terminal element, wherein the second lead extends into the second socket; and

firing the sensor element such that the first socket defines a first chamber configured to receive a first terminal element and the second socket defines a second chamber configured to receive a second terminal element.

16. The method of Claim 15, further comprising disposing a first terminal element in the first socket such that the first terminal element is in electrical communication with the first lead.

17. The method of Claim 16, wherein the first terminal element is metallurgically connected to the first lead.

18. The method of Claim 16, wherein the first terminal element is mechanically connected to the first lead.

19. The method of Claim 15, further comprising disposing a second terminal element in the second socket such that the second terminal element is in electrical communication with the second lead.

20. The method of Claim 15,
wherein forming the first socket further comprises forming a first opening into the sensing element and disposing first fugitive material in the first opening, and
wherein forming the second socket further comprises forming a second opening into the sensing element and disposing second fugitive material in the second opening.

21. The method of Claim 13, wherein forming the first socket further comprises disposing a first tool into and/or between a first layer of the sensor element.

22. A method for sensing a gas, comprising:
contacting a sensor element with a gas to be sensed, wherein the sensor element comprises

a first electrode and a second electrode in mutual ionic communication with an electrolyte;

a first socket defining a first chamber configured to receive a first terminal element;

the first terminal element disposed in the first socket and in physical and electrical communication with a first wire;

a first lead disposed in electrical communication with the first electrode and in physical and electrical communication with the first terminal element;

a second socket defining a second chamber configured to receive a second terminal element;

the second terminal element disposed in the second socket and in physical and electrical communication with a second wire;

a second lead disposed in electrical communication with the second electrode and in physical and electrical communication with the second terminal element;

wherein the first terminal element and the second terminal element are in electrical communication with a control module; and

producing an electromotive force.

23. A ceramic device, comprising:

a first lead and a second lead are disposed within a ceramic element,
a first socket is disposed near a rear portion of the ceramic element and defining a first chamber for receiving a first terminal element, wherein the first lead is disposed in physical communication with and extends into the first socket, and the first socket is disposed on a first socket plane that is parallel a first lead plane comprising the first lead;

the first terminal element is disposed in the first socket and electrical communication with the first lead;

a second socket is disposed near a rear portion of the ceramic element and defining a second chamber for receiving a second terminal element, and wherein the second lead is disposed in physical communication with and extends into the second socket, and the second socket is disposed on a second socket plane that is parallel a second lead plane comprising the second lead;

the second terminal element is disposed in the second socket and in electrical communication with the second lead;

a first resistor lead and a second resistor lead are disposed on a resistor plane within the ceramic element;

a first resistor socket is disposed in a rear portion of the ceramic element and defining a first resistor chamber for receiving a first resistor terminal element, wherein the first resistor lead is disposed in physical communication with and extends into the first resistor socket;

a second resistor socket is disposed in a rear portion of the ceramic element and defining a second resistor chamber for receiving a second resistor terminal element wherein the second resistor lead is disposed in physical communication with and extends into the second resistor socket; and wherein the first resistor socket and the second resistor socket are disposed on a resistor socket plane that is parallel to the resistor plane;

a first resistor terminal element is disposed in the first resistor socket and in electrical communication with the first resistor lead; and

a second resistor terminal element is disposed in the second resistor socket and in electrical communication with the second resistor lead.